UCRL-JC-124677 Abs

Abstract Submitted
for the DPP96 Meeting of
The American Physical Society

Sorting Category: 4.1 (theoretical)

Non-local transport and plasma heating by a probe laser beam. E. A. WILLIAMS, S. GLENZER, C. A. BACK, R. L. BERGER, K. ESTABROOK, *Lawrence Livermore National Laboratory* — There is an aspect of non-local transport theory that is yet to be tested experimentally. Namely, it is not necessary for the heat flux to reach any particular multiple of the free-streaming heat flux to be inhibited, that is less than Spitzer-Härm. Such behaviour cannot be modeled by the use of a flux-limit. This occurs, for instance, when a region of plasma is heated by inverse brehmsstrahlung of a probe laser whose diameter is small compared to some multiple $\simeq 24(\lambda_{ei}\lambda_{ee})^{1/2}$ of the electron stopping length. In this situation, the electrons on the tail of the distribution transport radially faster than they can be re-populated by electron-electron collisions, and the resulting transport is inhibited. The reduced energy transport causes the plasma temperature within the probe beam to rise more rapidly. Thomson scattering measurements were performed at the Nova laser facility to test the non-local heat transfer model. A high-Z plasma of millimeter size was produced by irradiating a flat gold disk with one 3ω beam using a 1.5ns, 3.8kJ square pulse. The coronal plasma was probed with a 2ω beam 500μm from the disk surface. The probe laser was focussed to 150μm and ranged in energy from 50-500 J in a square pulse. Local plasma temperatures were obtained from the wavelength separation of the ion acoustic peaks in the Thomson scattering spectra from the probe. The observed heating from the beam is compared to calculations using local and non-local heat transfer models

Ed Williams
williams@icf.llnl.gov
Lawrence Livermore National Laboratory

☐ Prefer Oral Session
☒ Prefer Poster Session

Date submitted: July 3, 1996 Electronic form version 1.1